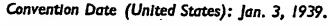
RESERVE COPY

PATENT **SPECIFICATION**



538,948



Application Date (in United Kingdom): Dec. 19, 1939. No. 32545/39.

Complete Specification Accepted: Aug. 22, 1941.

COMPLETE SPECIFICATION

A Method of Generating Heat by Chemical Means

We, UNITED STATES APPLIANCE COR-PURATION, a corporation organized under the laws of the State of California, United States of America, having its address at 984, Folsom Street, San Francisco, California, United States of America. do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described 10 and ascertained in and by the following

statement:-

This invention relates to a method of generating heat more particularly for use in the permanent waving of hair. The 15 method according to the invention is particularly suitable for use with a pad of the type disclosed in Specifications Nos. 501,886 and 537,247, wherein an exothermic reaction is carried out between a 20 chemical solution and metallic aluminium.

It is an object of the present invention to provide an improved method of the above character which will afford the 25 desired type of controlled exothermic reaction, and which at the same time will be of such a character as to afford utmost safety. With respect to features affording utmost safety, particular reference 80 can be made to the absence of highly inflammatory or explosive compounds in the solution either before or after reaction. even though the solution may be applied to impregnate cellulose fibre such as 35 blotting paper.

The invention accordingly provides a method of generating heat more particularly for use in the permanent waving of hair, in which an exothermic reaction is 40 produced between metallic aluminium and an aqueous solution of copper nitrate in the absence of substantial amounts of

an active oxidising agent.

The exothermic reaction between the 45 aluminium and the copper nitrate solution involves displacement of copper with aluminium, and as a result of the reaction, certain end products or compounds are formed. The solution avoids the use of 50 active oxidizing agents, e.g. sodium chlorate, which are objectionable in solutions of this character.

We have found that copper nitrate can

[Price 1/-]

serve the dual purpose of providing an exothermic with metallic 55 reaction aluminium, and serving as a depolarizer, thus making it unnecessary to use an additional depolarizer or oxidizing agent.

In addition to the copper nitrate content, we may make use of one or more 60 additional salts serving to activate the reaction. We prefer that these salts be such that they afford a chloride ion. For example reference can be made to ammonium chloride, copper ammonium 65 chloride, aluminium chloride, sodium chloride, and potassium chloride.

As specific examples of solutions which can be used with good results, we can make use of a solution formed as 70

follows: --

10 gms. copper ammonium chloride. 29 gms. copper nitrate.

Sufficient water to form a total of 96 cc. of solution.

When the above solution is contacted with metallic aluminium, as for example with a piece of aluminium foil, a controlled exothermic reaction takes place which proceeds efficiently until either the 80 solution or the metallic aluminium are depleted. According to our observations, during the reaction copper is displaced from both the copper ammonium chloride and the copper nitrate, by the metallic 85 aluminium, and the hydrogen ion concentration of the solution changes from an initial relatively high acidity, to a final pH value in the neighbourhood of neutrality or slightly alkaline.

Another solution making use of copper nitrate, which can be employed with good results, is as follows:

9 gms. ammonium chloride. 40 gms. copper nitrate.

Sufficient water to form a total of 96 cc. of solution.

The last named composition is somewhat similar to the first one specified, except that all of the available copper is in the 100 form of copper nitrate, although the ammonium chloride furnishes a source of chloride ion, the same as copper ammonium chloride. Here again there is a shift in the hydrogen ion concentration 105 of the solution, as an exothermic reaction

2

proceeds, whereby the pH value changes from an initial acidity to substantial neutrality or alightly alkaline condition,

at the end of the reaction.

The method according to the invention is particularly suitable for use with the types of pad disclosed in Specifications Nos. 501,886 and 537,247. In using these pads, the solution is taken up by the 10 absorbent material of the inner assembly as is fully described in the said Specifications.

After the pad has been used a part of the original solution remains as an im-15 pregnating medium in the inner assembly, together with certain end products of the reaction. It has been found that such an impregnated inner assembly remains relatively moist due to the deliquescent or

20 hygroscopic nature of the compounds present. Thus the temperature to which such an inner assembly must be raised before combustion occurs, is relatively high compared to an assembly impregnated with 25 similar chemicals but in dry form. In

this connection it can be explained that if the sheets of absorbent material of the inner assembly are formed of ordinary blotting paper, or like cellulose material,

80 the presence of an oxidizing agent like sodium chlorate in substantially dry condition may form a highly inflammable or practically explosive article.

A further characteristic of the present 35 invention is that the end chemical compounds or products formed during the reaction, are not explosive in character insofar as detonation is concerned. This is likewise true where the absorbent mate-

40 rial of the pad consists of or includes cellulose material.

In addition to the foregoing, the solu-

tions described afford a controlled exothermic reaction in that the interior of the pad is raised to a predetermined temperature 45 and held substantially at such temperature until the end of the reaction period. Also the solution has sufficient reactivity to the aluminium foil to commence a heating period within a reasonable period of 50 time after introduction of the solution into the pad.

Having now particularly described and ascertained the nature of our said invention and in what manmer the same is to be 55 performed, we declare that what we claim

1. A method of generating heat more particularly for use in the permanent waving of hair, in which an exothermic 60 reaction is produced between metallic aluminium and an aqueous solution of copper nitrate in the absence of substan-

tial amounts of an active oxidising agent. 2. A method according to claim 1, in 65 which the copper nitrate solution contains

an activator.

3. A method according to claim 2, in which the activator is selected from the group consisting of copper ammonium 70 chloride, ammonium chloride, potassium chloride and sodium chloride.

4. A method of generating heat more particularly for use in the permanent waving of hair substantially as herein-75 before described.

Dated this 19th day of December, 1939. HASELTINE, LAKE & CO., 28, Southampton Buildings, London, England, and 19-25, West 44th Street, New York, U.S.A., Agents for the Applicants.

Learnington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1941.